# 6BN6

# Beam Tube

**7-PIN MINIATURE TYPE**

**For Use in FM and TV Receivers As Combined Limiter, Discriminator, and Audio-Voltage-Amplifier Tube**

## GENERAL DATA

**Electrical:**

| | | |
|---|---|---|
| Heater, for Unipotential Cathode: | | |
| Voltage (AC or DC) | 6.3 ± 10% | volts ← |
| Current at 6.3 volts | 0.3 | amp |
| Direct Interelectrode Capacitances:▲ | | |
| Grid No.1 to cathode & internal shields, plate, grid No.3, grid No.2, and heater | 4.2 | μμf |
| Grid No.3 to cathode & internal shields, plate, grid No.2, grid No.1, and heater | 3.3 | μμf |
| Grid No.1 to grid No.3 | 0.004 max. | μμf |

**Mechanical:**

| | |
|---|---|
| Operating Position | Any |
| Maximum Overall Length | 2-5/8" |
| Maximum Seated Length | 2-3/8" |
| Length, Base Seat to Bulb Top (Excluding tip) | 2" ± 3/32" |
| Maximum Diameter | 0.650" to 0.750" ← |
| Dimensional Outline | See *General Section* |
| Bulb | T5-1/2 |
| Base | Small-Button Miniature 7-Pin (JEDEC No.E7-1) |
| Basing Designation for BOTTOM VIEW | 7DF |

Pin 1 - Cathode, Internal Shields
Pin 2 - Grid No.1
Pin 3 - Heater
Pin 4 - Heater
Pin 5 - Grid No.2
Pin 6 - Grid No.3
Pin 7 - Plate

## LIMITER & DISCRIMINATOR SERVICE ←

**Maximum Ratings,** ***Design-Maximum Values:***

| | | |
|---|---|---|
| PLATE SUPPLY VOLTAGE | 330 max. | volts |
| GRID-No.3 (QUADRATURE-GRID) VOLTAGE | ● | |
| GRID-No.2 (ACCELERATOR-GRID) VOLTAGE | 110 max. | volts |
| GRID-No.1 (LIMITER-GRID) VOLTAGE: | | |
| Positive-peak value | 60 max. | volts |
| CATHODE CURRENT | 13 max. | ma |
| PEAK HEATER-CATHODE VOLTAGE: | | |
| Heater negative with respect to cathode | 200 max. | volts |
| Heater positive with respect to cathode | 200■ max. | volts |

← Indicates a change.

**Typical Operation:**

| | *In accompanying typical quadrature-grid-fm-detector circuit* | | | |
|---|---|---|---|---|
| *Input-Signal Center Frequency* | *4.5* | *10.7* | *10.7* | *Mc* |
| Plate Supply Voltage. | 270 | 85 | 285 | volts |
| Plate Voltage . . . . | 121 | 63 | 122 | volts |
| Grid-No.3 Voltage . . | ● | ● | ● | |
| Grid-No.2 Voltage . . | 100 | 55 | 100 | volts |
| Cathode-Circuit Resistance★ . . . . | 200 to 400 | 200 to 400 | 200 to 400 | ohms |
| Peak AF Output Voltage | 16.8 | 6 | 16.6 | volts |
| Minimum Grid-No.1 Signal Voltage (RMS) for AM rejection★ . | 2 | 1.25 | 2 | volts |
| Minimum Grid-No.1 Signal Voltage (RMS) for limiting action♦ | 1.25 | 1.25 | 1.25 | volts |
| Plate Current . . . . | 0.44 | 0.25 | 0.49 | ma |
| Grid-No.2 Current . . | 10 | 4.1 | 9.8 | ma |
| Plate Load Resistor . | 0.33 | 0.085 | 0.33 | megohm |
| Linearity Resistor. . | 1000 | 470 | 1500 | ohms |
| Integrating Capacitor . . . . . | 0.001 | 0.002 | 0.001 | μf |
| Coupling Capacitor. . | 0.25 | 0.25 | 0.01 | μf |
| Frequency Deviation . | ±25 | ±75 | ±75 | kc |
| AM Rejection: | | | | |
| For grid-No.1 signal volts (RMS) = 2 . | 25 | 31 | 20 | db |
| For grid-No.1 signal volts (RMS) = 3 . | 30 | 30 | 29 | db |
| Total Harmonic Distortion. . . . . | 1.8 | 2 | 1.6 | % |

▲ Without external shield.

● For proper operation of this electron tube in the accompanying Typical Quadrature-Grid-FM Detector Circuit, the Q of the quadrature-grid tuned circuit ($L_1$, C6) should be sufficiently high to assure that a 4-volt rms signal is developed at the quadrature grid when a 2-volt rms signal at the center frequency is applied to grid No.1.

It is recommended that $L_1$ be shunted by a capacitance of at least 10 μμf. This capacitance may be composed of tube capacitance, stray capacitance, the distributed capacitance of $L_1$, and a fixed capacitor.

■ The dc component must not exceed 100 volts.

★ The cathode-circuit resistance should be adjusted for maximum AM rejection at the AF output of the circuit at the specified grid-No.1 signal voltage. AM rejection is measured with an applied signal containing 30 per cent amplitude modulation and 30 per cent frequency modulation.

♦ At signal levels above specified value, limiting is within ±2 decibels.

## → OPERATING CONSIDERATIONS

*To insure proper phasing* of the signal voltage developed at the quadrature grid, the components of the quadrature-grid circuit should be shielded from those of the control-grid circuit.

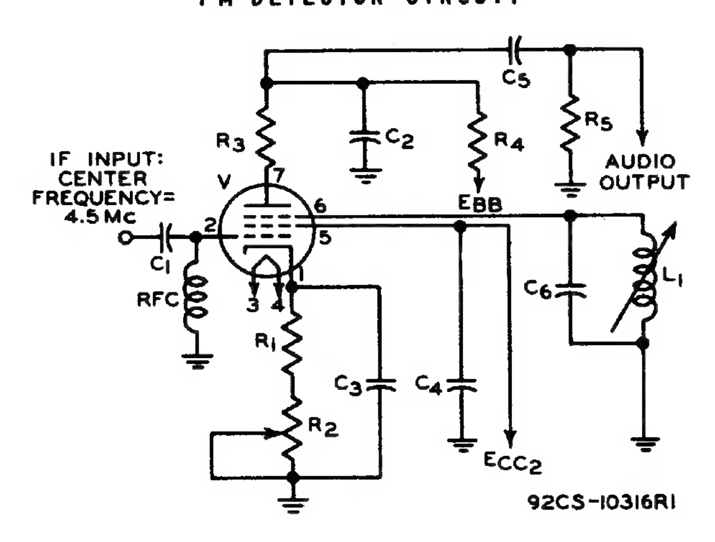
*To obtain a symmetrical discriminator-response curve*, the plate currents for no input signal and for unmodulated

→ Indicates a change.

input signal should be equal. To assure this equality, it is necessary that the plate voltage and grid-No.2 voltage have the proper values.

The proper plate voltage for any grid-No.2 voltage may be determined from the accompanying *Operation Characteristics* curve. This curve may also be used to determine the average dynamic plate current for any combination of grid-No.2 voltage and plate voltage.

## TYPICAL QUADRATURE-GRID-FM-DETECTOR CIRCUIT

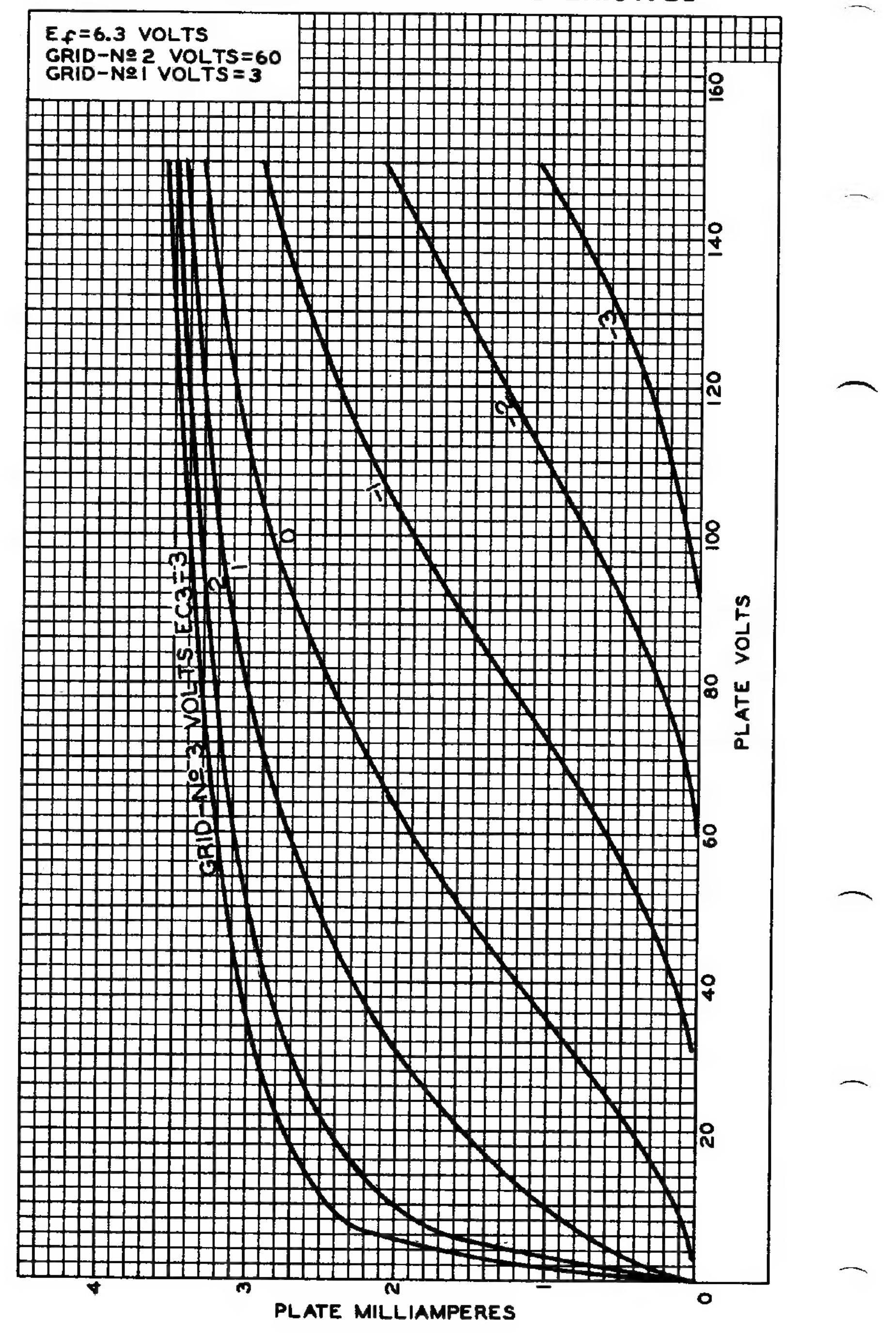



$C_1$: 100 μμf
$C_2$: Integrating capacitor, 0.001 μf
$C_3$ $C_4$: 0.01 μf
$C_5$: 0.25 μf
$C_6$: 10 μμf●
$L_1$: ●
$R_1$: 200 ohms
$R_2$: Cathode-bias potentiometer, 200 ohms
$R_3$: Linearity resistor, 1000 ohms
$R_4$: Plate-load resistor, 0.33 megohm
$R_5$: 0.47 megohm
V: Electron-tube-type 6BN6

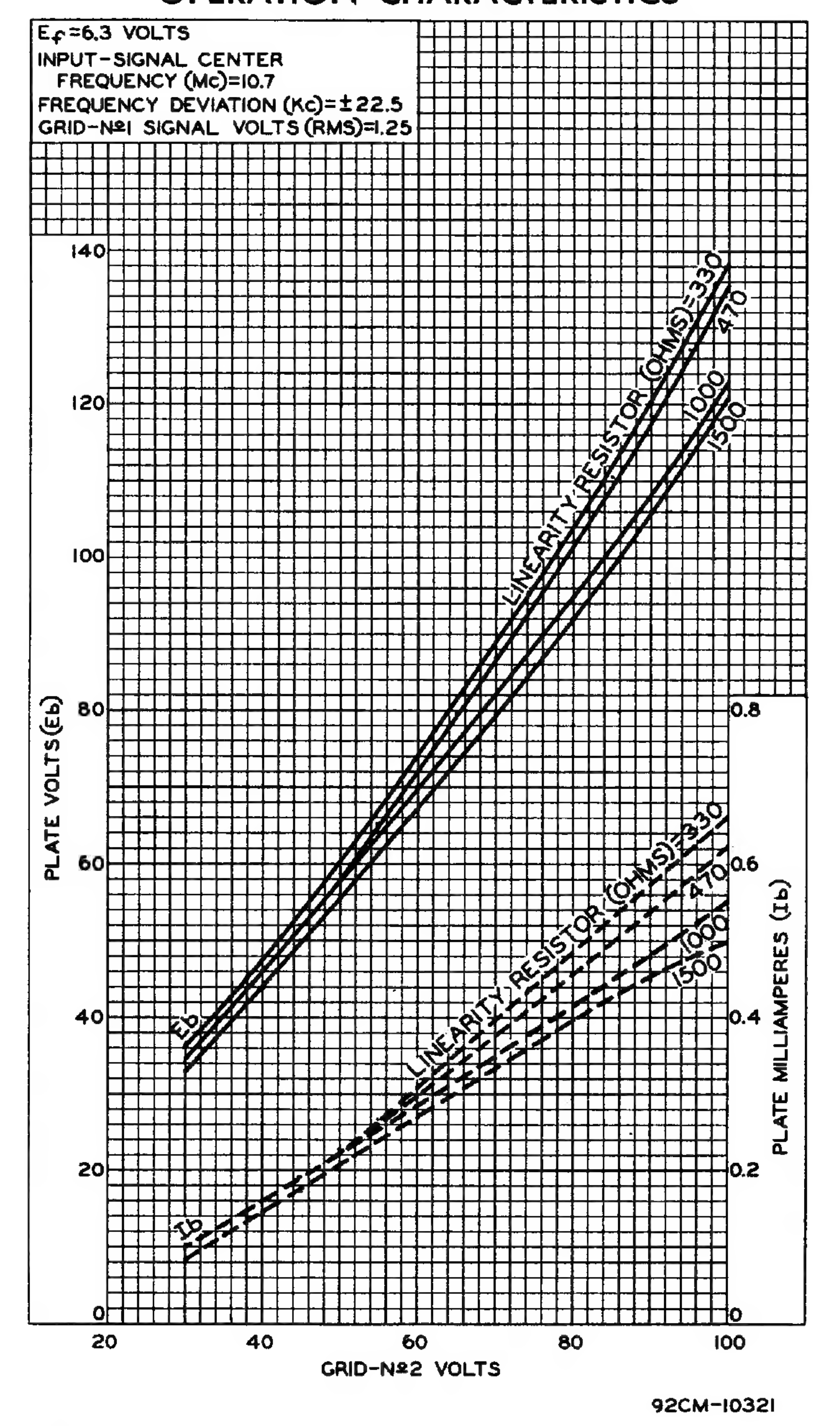
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## AVERAGE PLATE CHARACTERISTICS

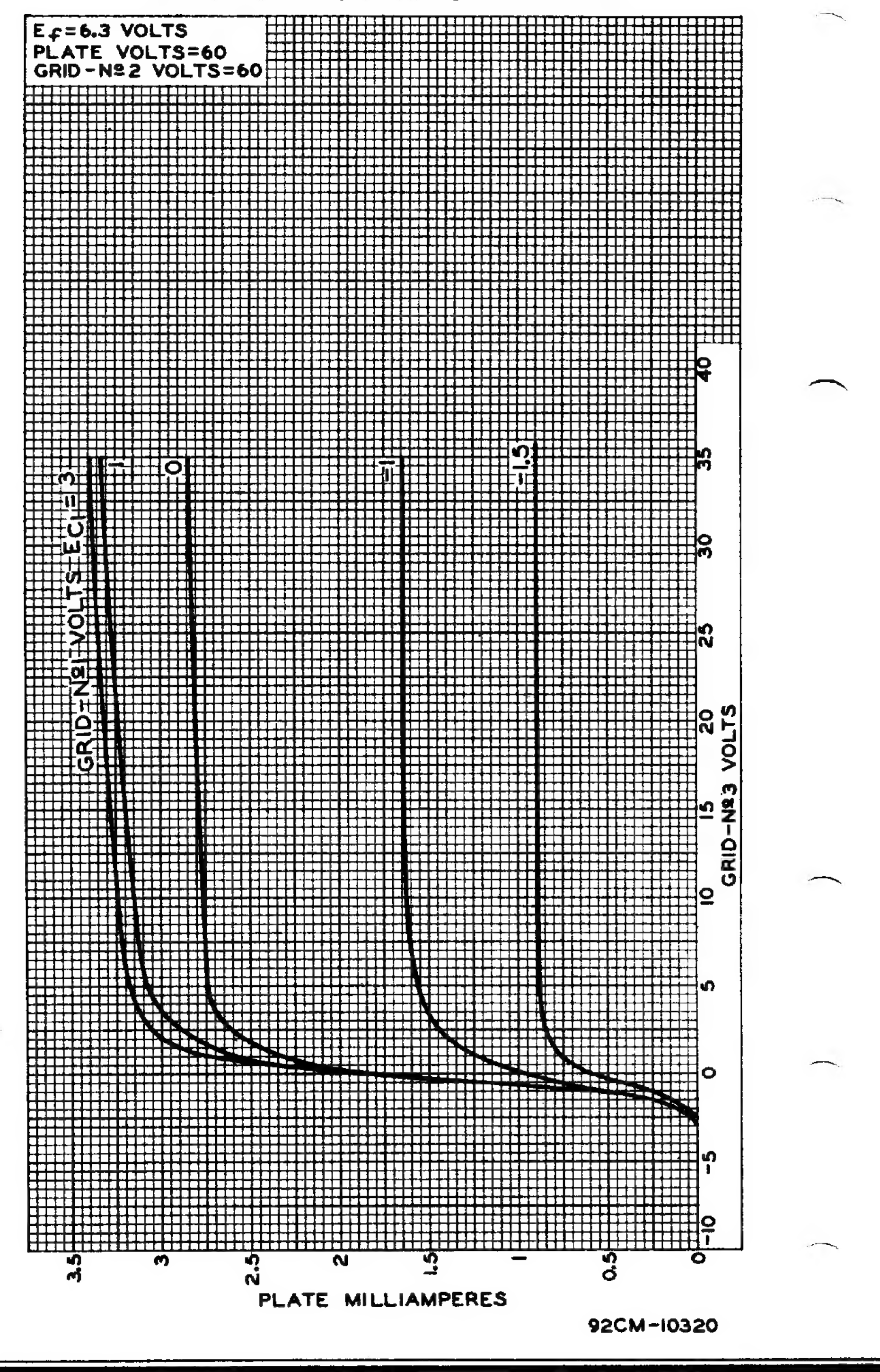



92CM-10319



OPERATION CHARACTERISTICS
Ef=6.3 VOLTS
INPUT-SIGNAL CENTER FREQUENCY (Mc)=10.7
FREQUENCY DEVIATION (Kc)=±22.5
GRID-Nº1 SIGNAL VOLTS (RMS)=1.25
LINEARITY RESISTOR (OHMS)=330
470
1000
1500
Eb
Ib
PLATE VOLTS (Eb)
PLATE MILLIAMPERES (Ib)
GRID-Nº2 VOLTS
140
120
100
80
60
40
20
0
0.8
0.6
0.4
0.2
20
40
60
80
100
92CM-10321

## AVERAGE CHARACTERISTICS




92CM-10320

## AVERAGE CHARACTERISTICS

